



Original article

Changing frequency of parotid gland neoplasms – analysis of 560 tumours treated in a district general hospital

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An analysis of all parotidectomies performed for neoplastic lesions in the maxillofacial unit at a district general hospital during a 26-year period between 1974–1999 was undertaken. The details analysed were age, sex, histology and temporal variations in the frequency of specific tumour types during the study period. A total of 538 parotidectomies performed on 529 patients in whom 560 tumours were present, formed the basis of this study. Marked variations were present in the age and sex distribution and relative frequency of specific tumour types in this study, when compared to previous reports. There were also differences in the age and sex distribution of pleomorphic adenoma and adenolymphoma ($P < 0.0001$) in this study. The relative frequency of benign tumours and adenolymphoma increased, whereas that of pleomorphic adenoma decreased during the study period. In addition, there was a statistically significant decrease in the relative frequency of pleomorphic adenoma ($P < 0.0001$) and an increase in adenolymphoma ($P < 0.0001$) when comparisons were made with previous studies. This study from a defined population may be more representative of the true proportion of specific tumours in this population. The potential implications of the results on the investigation and treatment of parotid neoplasms is highlighted.

Key words: Parotid tumours – Parotid neoplasms – Salivary gland

Neoplasms arising from the salivary glands are relatively uncommon and account for less than 3% of all head and neck tumours.¹ Salivary tumours are a heterogeneous group of lesions and there are significant variations in the incidence of individual tumour types in the different salivary glands. The parotid gland accounts for the majority of salivary neoplasms, with about 70% of the tumours occurring in this gland.^{2,3} The estimated incidence of parotid tumours is about 2.4 per 100,000 per year.⁴

Previous reports of parotid tumours with a special emphasis on demographic data have been from specialised

cancer centres or pooled data from a variety of sources.^{2–8} Little is known about the frequency of different tumour types that is likely to present to an individual clinician in a district general hospital, treating patients from a defined population. This paper aims to highlight our experience with 560 parotid neoplasms treated over a period of 26 years, with particular reference to age, sex, histology and temporal variations in the frequency of specific tumours over this period of time. In addition, the results are compared with other large series reported in the last four decades. The potential implications of the results on the

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investigation and treatment of parotid neoplasms is also highlighted.

Patients and Methods

The case records and histology reports of all the patients who underwent total or superficial parotidectomy in a 26-year period from 1974–1999 in the maxillofacial unit at St Richard's Hospital, Chichester and Southland's Hospital, Shoreham-by-Sea were scrutinised. The details analysed were age, sex, histology and temporal variations in the frequency of specific tumours during the period of the study.

In the study period, 698 parotidectomies were carried out for neoplastic and non-neoplastic conditions: 153 parotidectomies were performed for inflammatory conditions and 545 were performed for neoplastic lesions. A total of 569 neoplasms were diagnosed, but sufficient data were not available in 7 cases. The remaining 538 parotidectomies performed on 529 patients in whom 560 tumours were present forms the basis of this study. Parotidectomies performed for recurrent tumours were not included in the study. The tumours were categorised according to the Thackray/Sobin⁹ and WHO¹⁰ classification.

Results

Histology

The relative frequency of different tumour types is shown in Table 1: 82.1% of the tumours were benign and 17.9% were malignant. Pleomorphic adenoma was the most frequent benign tumour accounting for 48.9% of all tumours, followed by adenolymphoma which accounted for 26.8%. The most common malignant neoplasm was lymphoma, which accounted for 3.9%, followed by adenocarcinoma which accounted for 3.4% of all tumours. Multiple tumours were present in 23 patients (4.3%), and in 2 patients tumours of differing histology occurred synchronously (Table 1).

Age and sex

The age and sex distribution of the patients is shown in Table 2. Parotid gland neoplasms occurred over a wide age range, between 6–99 years, but were most frequent in the 7th decade. Benign tumours occurred most commonly in the 7th decade and malignant tumours in the 8th decade. Pleomorphic adenoma occurred in patients aged 12–95 years, with a mean age of 55.1 years and a peak incidence in the 7th decade. Adenolymphoma occurred in patients aged 25–89 years, with a mean age of 68.1 years and a peak incidence in the 8th decade. However, adenolymphoma

Table 1 Frequency of specific parotid tumours

Tumour type	No. of		Frequency	
	Pat.	Tum.	(%) Tot.	(%) B/M
BENIGN	432	460	82.1	100
Pleomorphic adenoma	273	274	48.9	59.6
Adenolymphoma	125	150	26.8	32.6
Oxyphil adenoma	2	3	0.5	0.7
Basal cell adenoma	2	2	0.4	0.4
Myoepithelioma	2	2	0.4	0.4
Monomorphic adenoma (us)*	9	9	1.6	2.0
Lipoma	6	7	1.3	1.5
Lymphoepithelial lesion	5	5	0.9	1.1
Other benign lesions	8	8	1.4	1.7
MALIGNANT	99	100	17.9	100
Lymphoma	22	22	3.9	22
Adenocarcinoma	18	19	3.4	19
Squamous cell carcinoma	17	17	3.0	17
Mucoepidermoid carcinoma	10	10	1.8	10
Adenoid cystic carcinoma	10	10	1.8	10
Carcinoma ex pleomorphic ad.	10	10	1.8	10
Acinic cell carcinoma	3	3	0.5	3
Other malignant tumours	9	9	1.6	9
TOTAL	531**	560	100	–

Pat., patients; Tum., tumours; Tot., total; B/M, benign/malignant

* Unspecified

** Two patients had tumours of different histology occurring synchronously.

was found in only 7 patients (5.6%) aged below 50 years. Age was a significant predictor of tumour type, in which patients with adenolymphoma were older than those with pleomorphic adenoma ($t = 7.81$, $P < 0.0001$). The mean age of occurrence and peak incidence varied according to the specific tumour type (Table 2).

Parotid neoplasms occurred in equal frequency among men and women, when all tumours were taken into account. Benign tumours were more common in women (M:F, 1:1.1), whereas malignant tumours were more common in men (M:F, 1.2:1). There was a significant difference in the sex predilection of pleomorphic adenoma (M:F, 1:1.6) and adenolymphoma (M:F, 2:1) ($\chi^2 = 29.64$, $df = 1$, $P < 0.0001$). Tumours of different types occurred at varying frequencies in both the sexes (Table 2).

Temporal variations

When the study period was divided into two equal groups, 1974–1986 and 1987–1999, the relative frequency of benign tumours increased from 79.8% to 89.9% when all neoplasms were considered. When only epithelial neoplasms were taken into account, the frequency of benign tumours increased from 81.8% to 87% (Fig. 1). The relative frequency of pleomorphic adenoma and adenolymphoma varied

Table 2 Age and sex characteristics of specific tumour types

Tumour	Age range (years)	Mean age (years)	Peak incidence	M:F ratio
BENIGN tumours	12–95	59.2	7th decade	1:1.1
Pleomorphic adenoma	12–95	55.1	7th decade	1:1.6
Adenolymphoma	25–89	68.1	8th decade	2:1
Oxyphil adenoma	74–87	79.3	8th decade	All female
Basal cell adenoma	40–64	52	Diff. decades	1:1
Myoepithelioma	24–92	58	Diff. decades	All female
Monomorphic adenoma (us)*	44–86	63.6	7th decade	1.3:1
Lymphoepithelial lesion	50–67	59.8	6th decade	1.5:1
Lipoma	35–74	61	7th & 8th decades	2:1
MALIGNANT tumours	6–99	67.6	8th decade	1.2:1
Lymphoma	44–90	70.3	8th decade	1.2:1
Adenocarcinoma	37–91	68.8	8th decade	2.2:1
Squamous cell carcinoma	55–98	78.5	9th decade	2.4:1
Mucoepidermoid carcinoma	6–84	52.9	7th decade	1:1.5
Carcinoma ex pleomorphic adenoma	64–71	66.4	7th decade	1:2.3
Adenoid cystic carcinoma	19–99	63	8th & 9th decades	1:2.3
Acinic cell carcinoma	30–74	45.3	4th decade	1:2
TOTAL	6–99	60.7	7th decade	1:1

*Unspecified.

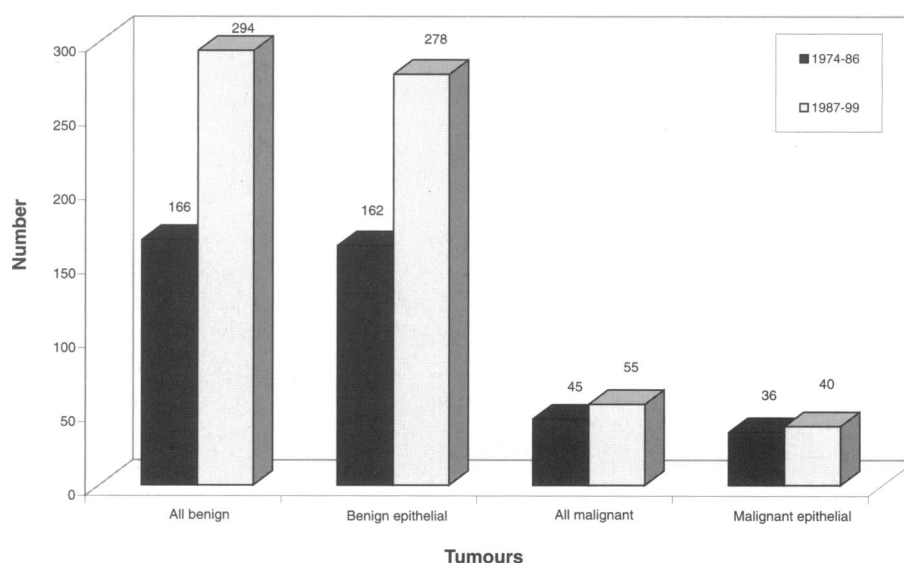


Figure 1 Changing frequency of benign and malignant tumours in the two periods.

during the study period (Fig. 2). The gender predilection of pleomorphic adenoma also varied between the two periods (M:F, 1:2 *versus* 1:1.4), whereas that of adenolymphoma remained constant (M:F, 1.9:1 *versus* 2:1; Fig. 3).

When the present study was compared with other studies,^{2,6,7} there was a statistically significant decrease in the frequency of pleomorphic adenoma (overall trend: $\chi^2 = 264.5$, $df = 3$, $P < 0.0001$; linear trend: $\chi^2 = 257.9$, $df = 1$, $P < 0.0001$; non-linear trend: $\chi^2 = 6.62$, $df = 2$, $P < 0.035$) and an increase in the frequency of adenolymphoma (overall

trend: $\chi^2 = 274.2$, $df = 3$, $P < 0.0001$; linear trend: $\chi^2 = 238.8$, $P < 0.0001$; non-linear trend: $\chi^2 = 35.3$, $P < 0.0001$) over the last four decades (Table 3).

Discussion

In this study, 560 parotid neoplasms which were present in 538 parotidectomies performed on 529 patients were analysed with special emphasis on demographic data and temporal variations during the period of the study.

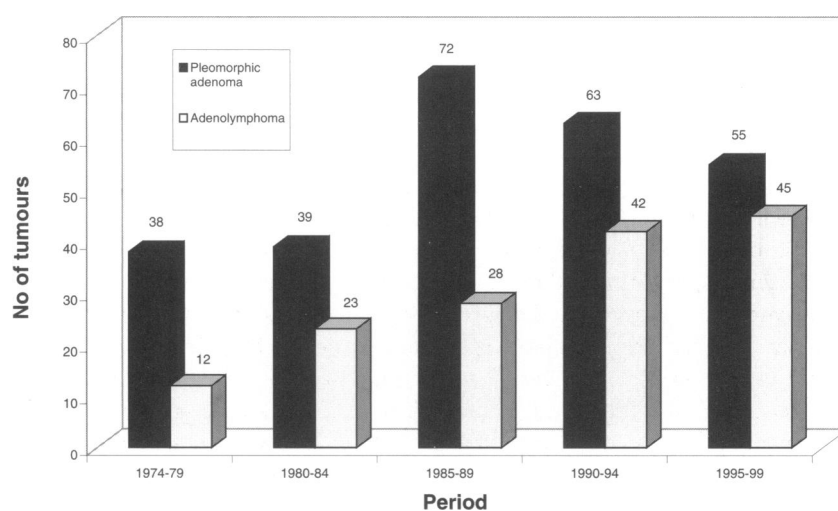


Figure 2 Changing frequency of pleomorphic adenoma and adenolymphoma.

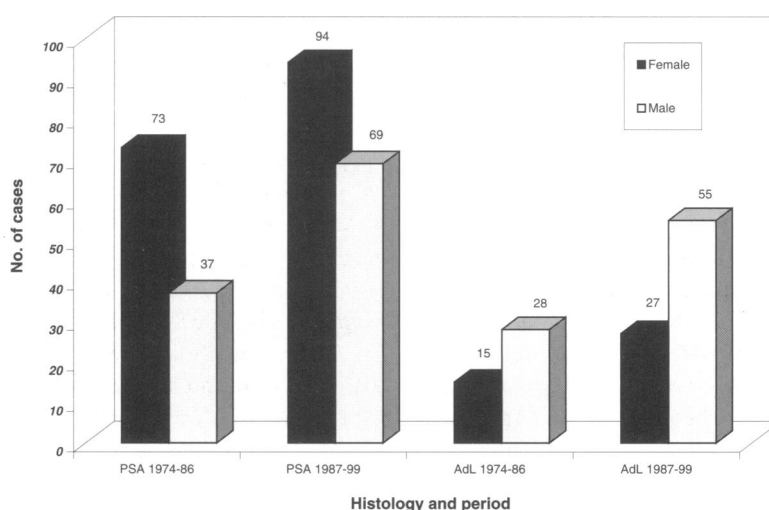


Figure 3 Sex predilection of pleomorphic adenoma (PSA) and adenolymphoma (AdL) in the two periods.

Table 3 Comparison of benign epithelial parotid neoplasms (percentages)

	Foote & Frazell ⁵	Eneroth ⁶	Thackray & Lucas ⁷	Eveson & Cawson ²	Present study	Present study	Present study
Year of publication	1953	1966	1974	1985	1974–1999	1974–1986	1987–1999
Pleomorphic adenoma (%)	89.6	93	86.4	74.3	62.3	67.7	59
Adenolymphoma (%)	10	5.7	10.9	16.4	34.1	29.2	36.9
Monomorphic adenoma (%)	0.8	1.2	2.9	9.3	3.6	3.1	3.9
Percentage of benign tumours (%)	68.3	82.5	83.4	85.4	85.9	81.8	87
Pleomorphic adenoma :adenolymphoma (ratio)	8.9:1	16.4:1	8:1	4.5:1	1.8:1	2.3:1	1.6:1

The present study from a district general hospital, treating patients from a specific geographical area, overcomes some of the deficiencies of previous studies, where the data were obtained from many sources or specialised cancer centres.^{2,3,5,6,8} The referral boundaries of this unit have not changed during the period of the study and the unit

serves a population of around 700,000, consisting of a higher proportion of elderly people when compared to the national average.¹¹ The unit carries out over 95% of parotid surgery (after reference to the histology records) in the above hospitals, and the frequencies reported in this paper may represent a fair picture of the relative frequency of specific

parotid tumours in this population.

Benign neoplasms accounted for 82.1% of all tumours (85.9% of epithelial tumours) in the present study. This was similar to the European data (82.2–85.4%),^{2,6,7} but greater than the American data from cancer centres (68.3%).^{3,5}

The present study was compared with publications from the last four decades, chosen because they reported the frequency and demographic data of a large number of parotid neoplasms.^{2,5,6,7} It becomes apparent that there has been a small but steady increase in the frequency of benign epithelial neoplasms over the last five decades (Table 3). This trend was also mirrored in the present study, where the frequency of benign epithelial tumours increased from 81.8% to 87% during the study period (Table 3). The decrease in the frequency of benign tumours in the American studies^{3,5} was partly due to the increased incidence of mucoepidermoid carcinoma and may also reflect the nature of the referral to specialised cancer centres.

There were also marked differences in the relative frequency of individual benign tumour types between the present study and those reported previously. Pleomorphic adenomas accounted for only 48.9% of all parotid neoplasms (52% of epithelial neoplasms) in the present study. This was less than that mentioned in the most recent general surgical¹² and speciality textbooks^{13,14} and other reports in the literature (63.4–75.8%).^{2,6,7,8} The mean age of occurrence of pleomorphic adenoma was 55.1 years, which was higher than that reported by Eveson² (46 years) and Main⁸ (47.9 years). Pleomorphic adenomas were more frequent in females (M:F, 1:1.6), which was again higher than that reported by the previous studies.² In addition, there was a decrease in the frequency of pleomorphic adenoma in women over the period of the study, with the male to female ratio decreasing from 1:2 in the earlier period to 1:1.4 in the later period (Fig. 3).

Adenolymphoma accounted for 26.8% of all parotid neoplasms (28.5% of epithelial neoplasms) in the present study. This was significantly higher than that reported by other authors (5.6–14%).^{5–8,15} The mean age of occurrence was 68.1 years, which was higher than that reported by Eveson⁸ (61.6 years) and Main⁸ (62.3 years). There was a male predominance (M:F, 2:1), which was similar to the reports by Eveson¹⁵ (1.6:1), but less than the reports by Foote⁵ (10:1), Kotwall¹¹ (3.7:1), Main⁸ (3:1) and Ebbs¹⁴ (2.6:1). The gender predilection of adenolymphoma, however, remained fairly constant during the period of the study. Multiple tumours were present in 17 cases (13.6%), of which 6 cases (4.8%) were bilateral (metachronous, 3; synchronous, 3) and in 11 cases (8.8%) ipsilateral (synchronous). These findings are similar to that reported in the previous studies.^{15–17}

The frequency of other monomorphic adenoma was 3.8%, which is less than the 8% reported by the salivary gland panel.² This could perhaps be due to a specialist

opinion being sought more frequently in the case of these rarer tumours.

When the relative frequency of individual benign epithelial tumours in the present series was compared with the other surveys, a more substantial decrease in the frequency of pleomorphic adenoma and an increase in the frequency of adenolymphoma becomes apparent (Table 3). This trend over the last four decades was highly statistically significant ($P < 0.0001$). Comparison of the ratio of pleomorphic adenoma to adenolymphoma, which is less likely to be influenced by referral patterns, also confirms this changing frequency of pleomorphic adenoma and adenolymphoma (Table 3).

When the two halves of the present study were analysed, the trend of an increase in the frequency of adenolymphoma compared to pleomorphic adenoma is maintained. Though there was an increase in the absolute number of both pleomorphic adenoma and adenolymphoma in the later half of the study period, the ratio of pleomorphic adenoma to adenolymphoma had decreased from 2.3:1 to 1.6:1 in the same period (Table 3). The increased frequency of adenolymphoma has been ascribed to the association of adenolymphoma with smoking and the proportional increase in female smokers.^{15–21}

Malignant tumours accounted for 17.9% of all parotid neoplasms. There was a decrease in the relative frequency of malignant tumours in the second period of the study, even though the actual number of malignant tumours in the second period increased to 55 from 45. A similar pattern was found when only malignant epithelial neoplasms were considered, where their frequency decreased to 13% in the second period from 18.2%, even though the actual number increased to 40 from 36 (Fig. 1).

The most common malignant tumour was a lymphoma, which accounted for 3.9% of all parotid tumours. This is similar to the finding of Mehle *et al*²² who reported a 4% frequency. Adenocarcinoma was the most frequent epithelial malignancy and accounted for 3.4% of all tumours, which was similar to those reported in other studies.^{2,3,5,8}

Squamous cell carcinoma was the second most common epithelial malignancy, accounting for 3% of all tumours. This is higher than that reported in other studies,^{2,7} and was more common in men (M:F, 2.4:1), which was also higher than that reported in the previous studies.² The relatively high incidence of the tumour may reflect the more elderly population served by this unit. The frequency of carcinoma ex pleomorphic adenoma was 1.8%, which is less than that reported by Eveson² (3.2%). There was a significant female predominance (M:F, 1:2.3), which differed from Eveson² who reported a ratio of 1:1.1.

Most of the previous large studies have not reported the frequency of parotid tumours of mesenchymal origin, either because they were absent or were excluded from

the analysis.^{2,5,6,8} Mesenchymal tumours accounted for 5.9% of all parotid neoplasms in the present series. The most frequent benign mesenchymal tumour was a lipoma, which accounted for 1.3% of all parotid tumours and differed from previous reports in which haemangioma was the most frequent benign mesenchymal 'tumour'.^{7,23} Lymphoma was the most frequent malignant mesenchymal tumour in the present series. It is important to take into account tumours of mesenchymal origin when considering the diagnosis of a parotid lump.

An accurate pre-operative diagnosis is often desirable for satisfactory management of parotid neoplasms. The investigations commonly employed to obtain a diagnosis of a parotid lump are fine needle aspiration cytology and either a CT scan or MRI. In this unit, a CT sialogram is often the imaging method of choice and the results of this will form a separate publication in the near future. The increasing frequency of benign tumours, in particular adenolymphoma, and the statistically significant differences in the sex predilection and age distribution between pleomorphic adenoma and adenolymphoma ($P < 0.0001$) could potentially be used to help target specific investigations with the aim of achieving a more accurate pre-operative diagnosis. Dynamic dual-phase scintiscanning with technetium-99, a recognised method of identifying adenolymphoma,^{24,25} could be used more frequently in these selected patient groups.

Superficial parotidectomy remains the treatment of choice for benign neoplasms in this unit. However, the role of a more conservative surgical approach advocated by recent publications for the treatment of adenolymphoma^{26,27} may have to be considered more often in view of the changing frequency of individual parotid neoplasms.

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